

Paper Reference 1MA1/1H
Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Total Marks

Mathematics
PAPER 1 (Non-Calculator)
Higher Tier

Wednesday 8 November 2023 – Morning
Time: 1 hour 30 minutes

**In the boxes below, write your name,
centre number and candidate number.**

Surname					
Other names					
Centre Number					
Candidate Number					

YOU MUST HAVE

Ruler, protractor, compasses, writing and drawing equipment, Formulae Sheet (enclosed). Tracing paper may be used.

YOU WILL BE GIVEN

Diagram Booklet

Turn over

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided in this Question Paper or on the separate diagrams – there may be more space than you need.

You must SHOW ALL YOUR WORKING.

Diagrams are NOT accurately drawn, unless otherwise indicated.

CALCULATORS MAY NOT BE USED.

Turn over

INFORMATION

The total mark for this paper is 80

The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.

There may be spare copies of some diagrams in case you need them.

ADVICE

Read each question carefully before you start to answer it.

Try to answer every question.

Check your answers if you have time at the end.

Turn over

5

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Turn over

1. Work out

$$6 \cdot 3 \times 2 \cdot 4$$

(3 marks)

Answer space continues on the next two pages.

Turn over

1. continued.

Turn over

1. continued.

(Total for Question 1 is 3 marks)

Turn over

2. (a) (i) Write down the value of 5^0

(1 mark)

(continued on the next page)

Turn over

2. (a) continued.

(ii) Write down the value of

$$5^{-2}$$

(1 mark)

(continued on the next page)

Turn over

2. continued.

(b) Write

$$\frac{2^5 \times 2^4}{2^3} \text{ in the form } 2^n \text{ where } n$$

is an integer.

(2 marks)

(Total for Question 2 is 4 marks)

Turn over

3. (a) Write **156** as a product of its prime factors.

(2 marks)

Answer space continues on the next page.

3. (a) continued.

(continued on the next page)

Turn over

3. continued.

- (b) Find the highest common factor
(HCF) of 156 and 130
(2 marks)**

**Answer space continues on the
next page.**

Turn over

3. (b) continued.

(Total for Question 3 is 4 marks)

Turn over

4. The mean length of 5 sticks is 4.2 cm

Nawal measured the length of one of the sticks as 7 cm

- (a) Work out the mean length of the other 4 sticks.

(3 marks)

Answer space continues on the next page.

4. (a) continued.

_____ cm

(continued on the next page)

Turn over

4. continued.

Remember:

**The mean length of 5 sticks is
4.2 cm**

**Nawal measured the length of one of
the sticks as 7 cm**

(continued on the next page)

Turn over

4. continued.

(b) Nawal made a mistake.

The stick was not 7 cm long.

It was 17 cm long.

**How does this affect your answer
to part (a)?**

(1 mark)

(Total for Question 4 is 4 marks)

Turn over

- 5. Look at the diagram for Question 5 in the Diagram Booklet.**

It shows point P on the line AB

Use ruler and compasses to

construct an angle of 90° at P

You must show all your construction lines.

(Total for Question 5 is 2 marks)

6. Look at the diagram for Question 6 in the Diagram Booklet.

It shows an isosceles triangle **ABD**
and the straight line **ABC**

$$\text{Angle DAB} = x^\circ$$

$$\text{Angle DBA} = y^\circ$$

$$\text{Angle DBC} = w^\circ$$

$$BA = BD$$

$$x : y = 2 : 1$$

Work out the value of **w**

(4 marks)

Answer space is on the next
two pages.

Turn over

6. continued.

Turn over

6. continued.

W = _____

(Total for Question 6 is 4 marks)

Turn over

7. Mano has three shelves of books.

There are y books on shelf **A**

There are $(3y + 1)$ books on shelf **B**

There are $(2y - 5)$ books on shelf **C**

There is a total of **44** books on the three shelves.

All the books have the same mass.

The books on shelf **B** have a total mass of **7500** grams.

(continued on the next page)

Turn over

7. continued.

**Work out the total mass of the books
on shelf A**

(5 marks)

**Answer space continues on the next
two pages.**

Turn over

7. continued.

Turn over

7. continued.

_____ grams

(Total for Question 7 is 5 marks)

Turn over

- 8. The normal price of a mattress is reduced by 40% in a sale.**

The price of the mattress in the sale is £660

Work out the normal price of the mattress.

(2 marks)

Answer space continues on the next page.

8. continued.

£ _____

(Total for Question 8 is 2 marks)

Turn over

9. Look at the diagram for Question 9 in the Diagram Booklet.

It shows a grid.

To cook rice

the number of cups of rice (x) : the
number of cups of water (y) = 4 : 5

- (a) Use this information to draw a graph on the grid in the Diagram Booklet to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.

(2 marks)

Space for working is on the next page.

Turn over

9. (a) continued.

(continued on the next page)

Turn over

9. continued.

- (b) (i) Find the gradient of the line
drawn in part (a)
(1 mark)**
-

(continued on the next page)

Turn over

9. (b) continued.

(ii) Explain what this gradient represents.

(1 mark)

(Total for Question 9 is 4 marks)

Turn over

- 10. The circumference of a circle is
10 metres.**

Work out the area of the circle.

Give your answer in terms of π

(3 marks)

**Answer space continues on the next
page.**

10. continued.

_____ m²

(Total for Question 10 is 3 marks)

Turn over

11. Look at the diagram for Question 11 in the Diagram Booklet.

It shows an incomplete box plot diagram.

Alice recorded the number of cars going into a village on each of 80 days.

The incomplete table on the following page and the incomplete box plot in the Diagram Booklet give information about her results.

(continued on the next page)

Turn over

11. continued.

	Number of cars
Least number	300
Lower quartile	
Median	900
Upper quartile	
Range	1000

(continued on the next page)

Turn over

11. continued.

(a) (i) Use the information in the table on the previous page to complete the box plot in the Diagram Booklet.

(ii) Use the information in the box plot to complete the table on the previous page. There are two spaces to fill. There is a spare copy of this table on page 14 in the Diagram Booklet if you wish to use it.

(3 marks)

(continued on the next page)

Turn over

11. continued.

On some of these 80 days Alice saw fewer than 1200 cars going into the village.

(b) Work out an estimate for the number of days Alice saw fewer than 1200 cars going into the village.

(2 marks)

Answer space continues on the next page.

Turn over

11. (b) continued.

(Total for Question 11 is 5 marks)

Turn over

12. The straight line **L** has equation
 $2y = 3x - 7$

Find an equation of the straight
line perpendicular to **L** that passes
through **(6, −5)**

(3 marks)

**Answer space continues on the next
page.**

12. continued.

(Total for Question 12 is 3 marks)

Turn over

13. Solid **A** and solid **B** are similar.

The ratio of the height of solid **A** to the height of solid **B** is **2 : 5**

The volume of solid **A** is **12 cm³**

Work out the volume of solid **B**
(3 marks)

Answer space continues on the next page.

Turn over

13. continued.

_____ **cm³**

(Total for Question 13 is 3 marks)

Turn over

14. Work out the value of

$$27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$$

(3 marks)

Answer space continues on the next page.

Turn over

14. continued.

(Total for Question 14 is 3 marks)

Turn over

15. Look at the diagram for Question 15 in the Diagram Booklet.

An object falls from rest.

The diagram shows the distance–time graph for the distance (d metres) fallen by the object t seconds after it starts to fall.

Work out an estimate for the gradient of the graph at $t = 3$

You must show how you get your answer.

(3 marks)

Answer space is on the next two pages.

Turn over

15. continued.

Turn over

15. continued.

(Total for Question 15 is 3 marks)

Turn over

16. At the start of year n the population of a species is P_n

At the start of the following year the population of the species is given by

$P_{n+1} = kP_n$ where k is a positive constant.

The population of the species at the start of year 1 is 8 million.

The population of the species at the start of year 2 is 6 million.

(continued on the next page)

Turn over

16. continued.

- (a) Work out the population of the species at the start of year 3
(3 marks)**

Answer space continues on the next page.

Turn over

16. (a) continued.

_____ million

(continued on the next page)

Turn over

16. continued.

Remember: At the start of year n the population of a species is P_n

At the start of the following year the population of the species is given by

$P_{n+1} = kP_n$ where k is a positive constant.

(b) At the start of year 5 the value of k is increased by 0.3 to a new constant value.

(continued on the next page)

Turn over

16. (b) continued.

Louise thinks that from the start of year 5 the population of the species would increase year on year.

Is Louise correct?

You must give a reason for your answer.

(1 mark)

Answer lines continue on the next page.

Turn over

16. (b) continued.

(Total for Question 16 is 4 marks)

Turn over

17. (a) Factorise

$$6x^2 - 5x - 4$$

(2 marks)

(continued on the next page)

Turn over

17. continued.

(b) Hence, or otherwise, solve

$$6x^2 - 5x - 4 < 0$$

(2 marks)

**Answer space continues on the
next page.**

Turn over

17. (b) continued.

(Total for Question 17 is 4 marks)

Turn over

18. Spinner **A** and spinner **B** are each spun once.

The probability that spinner **A** lands on red is $\frac{1}{4}$

The probability that both spinner **A** and spinner **B** land on red is $\frac{1}{24}$

Work out the probability that one spinner lands on red and the other spinner does NOT land on red.

(4 marks)

Answer space is on the next two pages.

Turn over

18. continued.

Turn over

18. continued.

(Total for Question 18 is 4 marks)

Turn over

19. Look at the diagram for Question 19 in the Diagram Booklet.

It is the graph of $y = \sin x^\circ$ for $-180 \leq x \leq 180$

(a) Use the graph to find estimates for the solutions of

$$\sin x^\circ = 0.75 \text{ for } -180 \leq x \leq 180$$

(2 marks)

Answer space continues on the next page.

Turn over

19. (a) continued.

(continued on the next page)

Turn over

19. continued.

(b) Write down a value of X such that

$$\sin(x + 20)^\circ = 0 \text{ for } -180 \leq x \leq 180$$

(1 mark)

$X =$ _____

(Total for Question 19 is 3 marks)

Turn over

**20. Look at the diagram for Question 20
in the Diagram Booklet.**

It shows triangle ABC

$$\mathbf{BC = 5 \text{ cm}}$$

$$\mathbf{BA = 10 \text{ cm}}$$

$$\mathbf{AC = 5\sqrt{7} \text{ cm}}$$

Find the size of angle ABC

You must show all your working.

(4 marks)

**Answer space continues on the next
page.**

Turn over

20. continued.

o

(Total for Question 20 is 4 marks)

Turn over

**21. (a) Look at the diagram
for Question 21 in the
Diagram Booklet.**

It shows a grid.

**On the grid, draw the graph of
 $x^2 + y^2 = 36$**

(2 marks)

(continued on the next page)

21. continued.

(b) Use your graph to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 36$$

$$2y = 3x$$

(3 marks)

(Total for Question 21 is 5 marks)

Turn over

22. The 2nd term of a geometric sequence is

$$3 + 2\sqrt{2}$$

The 3rd term of the sequence is

$$13 + 9\sqrt{2}$$

Find the value of the common ratio of the sequence.

Give your answer in the form $a + \sqrt{b}$ where a and b are integers.

You must show all your working.

(4 marks)

Answer space continues on the next two pages.

Turn over

22. continued.

Turn over

22. continued.

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

END OF PAPER
